Ontario

Apprenticeship
In-school Curriculum Standards

Powerline Technician

434A

2008-03597/

Apprenticeship
In-school Curriculum Standards

Powerline Technician

434A

Implementation date: November 2007
Printing date: December 2007

ISBN 978-1-4249-5247-2 (Print)
ISBN 978-1-4249-5248-9 (PDF)

© Queen's Printer for Ontario, 2007

07-281

Table of Contents

Introduction.....1

Program Summary of Reportable Subjects 2

S0121 Demonstrate Safe Work Practices..... 3

S0122 Communicate With Customers and Staff 6

S0123 Prepare Job Plan.....8

S0124 Select, Operate and Maintain Tools and Equipment..... 10

S0125 Install, Maintain and Remove Power Pole Systems 12

S0126 Maintain Transmission Towers and Structures 15

S0127 Install and Maintain Overhead Power Systems 17

S0128 Troubleshoot Overhead and Underground Power System 23

S0129 Install, Maintain Underground Distribution Systems 25

S0130 Install, Maintain and Remove Transformers.....27

S0131 Install, Operate and Maintain System Protection, Control and Instrumentation Equipment.....30

S0132 Handle Energized Lines Using Rubber Protective Equipment.....33

S0133 Handle Energized Lines Using Live Line Tool Methods.....35

S0134 Select, Maintain and Operate Rigging Equipment.....38

Introduction

This new curriculum standard for the Powerline Technician trade is derived from learning outcomes which were developed from the industry-approved training standard.

The reportable subjects are cross-referenced to the training standard for ease of comparison.

Each reportable subject and learning outcome identifies a recommended number of training hours. This hour allotment is broken into hours for instruction in theory and practical application. The division of the curriculum into reportable subjects that follow a natural progression of learning through the levels and branches of training will allow training centres and apprentices' flexibility in program delivery while still observing the importance of sequencing learning in a logical progression.

The curriculum is framed by and includes specific references to terminal performance objectives in the Apprenticeship Training Standards for Powerline Technician. However, it identifies only the learning that takes place off the job, in a training centre. The in-school program focuses primarily on the theoretical knowledge required to master the performance objectives of the Training Standards. Employers are expected to extend the apprentice's knowledge and skills through appropriate practical training on the work site. Regular evaluations of the apprentice's knowledge and skills is conducted throughout training to assure that all apprentices have achieved the learning outcomes identified in the curriculum standard. The balance between theoretical and practical evaluation is identified for each unit of learning outcomes.

Implementation date:

November 2007

Program Summary of Reportable Subjects

Number	Reportable Subjects	Hours Total	Hours Theory	Hours Practical
S0121	Demonstrate safe work practices	44	12	32
S0122	Communicate with customers and staff	9	2	7
S0123	Prepare job plan	23	8	15
S0124	Select, operate and maintain tools and equipment	19	9	10
S0125	Install, maintain and remove power pole systems	21	5	16
S0126	Maintain transmission towers and structures	12	4	8
S0127	Install, maintain overhead power systems	66	21	45
S0128	Troubleshoot overhead and underground power systems	15	15	0
S0129	Install, maintain underground distribution systems	35	17	18
S0130	Install, maintain and remove transformers	32	23	9
S0131	Install, operate and maintain system protection, control and	27	16	11
S0132	Handle energized lines, using rubber protective equipment	33	11	22
S0133	Handle energized lines, using live line tool methods	27	9	18
S0134	Select, maintain and operate rigging equipment	20	11	9
	Total	**383**	**163**	**220**

Number:	S0121
Title:	**Demonstrate Safe Work Practices**
Duration:	44 hrs
	Theory: 12 hours Practical: 32 hours
Prerequisites:	2.1, 2.3, 2.4
Co-requisites:	3.1, 3.2, 3.3, 3.4
Reference to training standard:	5420.01, 5420.02, 5420.03, 5420.04, 5420.05, 5420.06, 5420.07, 5420.08.

General Learning Outcome

Demonstrate safe work practices by identifying, controlling and eliminating all potential health and safety hazards; selecting, wearing, adjusting, using and maintaining personal protective devices; performing evacuation and rescue procedures; practicing good housekeeping; working within safe physical limits and applying correct body mechanics and applying the principles of induction, grounding and bonding.

Learning Outcomes

Upon successful completion, the apprentice is able to:

1.1 Identify, control and eliminate potential health and safety hazards.

1.2 Select, wear, adjust, use and maintain personal protective devices.

1.3 Perform evacuation or rescue procedures.

1.4 Practice good housekeeping.

1.5 Work within safe physical limits and apply correct body mechanics.

1.6 Apply the principles of induction, grounding and bonding.

Learning Content

1.1 Identify, control and eliminate potential health and safety hazards.

- Identify all hazards associated with a specific task.
- Select and apply the most effective method and / or barriers to eliminate or control the hazard.
- Demonstrate knowledge of equipment and material to be used.
- Document all hazards and actions taken to reduce, eliminate or control the hazard.
- Demonstrate knowledge of work to be performed.
- Identify applicable acts, codes, regulations and directives.

1.2 Select, wear, adjust, use and maintain protective devices.

- Identify the correct personal protective equipment required for the specific task.
- Select the appropriate personal protective equipment required to work in a variety of environments.
- Wear, adjust, use and maintain protective devices.
- Identify deficiencies in protective equipment and replace with approved equipment.

1.3 Perform evacuation & rescue procedures.

- Ensure personal safety prior to commencing any rescue.
- Demonstrate successful completion of pole top rescue.
- Demonstrate successful completion of tower rescue.
- Demonstrate successful completion of aerial device rescue.
- Demonstrate bucket evacuation from an aerial device simulating no-functional conditions.

1.4 Practice good housekeeping.

- Store tools and equipment in designated location after use.
- Clean up job site, eliminating debris.
- Clean all equipment properly after use.
- Store all equipment properly after use.
- Keep work area clear of obstructions.

1.5 Work within safe physical limits and apply correct body mechanics.

- Position body into best possible location while working aloft.
- Apply correct lifting techniques.
- Assess the task to identify whether additional mechanical or other assistance is required.
- Identify safe physical limits.
- Use correct methods to transport heavy material.

1.6 Apply the principles of induction, grounding and bonding.

- Apply the theory associated with the fundamentals of AC generation.
- Apply the theory associated with the hazards of induction.
- Apply the theory associated with the hazards of backfeed.
- Establish a zone of equipotential by applying bonding principles.
- Ensure adequate grounding of personnel and equipment by selecting the most appropriate ground electrode.

Number:	S0122
Title:	**Communicate with customers and staff.**
Duration:	9 Total Hours
	Theory: 2 hours Practical: 7 hours
Prerequisites:	S0121
Co-requisites:	
Reference to training standard :	5421.01, 5421.02, 5421.03, 5421.04

General Learning Outcome

The apprentice will communicate in a clear, effective and concise manner with co-workers, supervisors and the public.

Learning Outcomes

Upon successful completion, the apprentice is able to:

2.1 Communicate with co-workers.

2.2 Communicate with customers and external organizations.

2.3 Report hazards, injuries and environmental impacts.

2.4 Maintain documentation.

Learning Content

2.1 Communicate with co-workers.

- Complete the required documentation.
- Speak in a clear and legible fashion.
- Interpret direction .
- Demonstrate correct use of hand signals.
- Use electronic communication equipment.
- Demonstrate effective verbal, physical (body language) and listening skills.

2.2 Communicate with customers and external organizations.

- Complete the required documentation.
- Speak in a clear and legible fashion.
- Interpret direction.
- Demonstrate correct use of hand signals.
- Us electronic communication equipment.
- Convey technical information

2.3 Report hazards, injuries and environmental impacts.

- Report hazards, injuries and environmental impacts immediately
- Complete necessary documentation.
- Use the most appropriate device for reporting hazards, injuries and environmental impacts.

2.4 Maintain documentation.

- Complete Utility Work Protection Code documentation .
- Complete maintenance reports as required by manufacturers, company specifications.
- Log information onto time reporting documentation.
- Log information onto injury report.
- Complete accurate and detailed reports in a timely manner.
- Complete daily equipment and vehicle log book reports.
- Use computers.
- Write clearly and legibly.

Number:	S0123
Title:	**Prepare Job Plan**
Duration:	23 Total Hours
	Theory: 8 hours Practical: 15 hours
Prerequisites:	S0121-S0122
Co-requisites:	
Reference to training standard:	5422.01, 5422.02, 5422.03, 5422.04

General Learning Outcome

Demonstrate the ability to prepare a job plan by identifying work site; determining job methods, assignments and process; determining material and equipment and establishing lockout, tagging and hold-off procedures as per the utility Work Protection Code.

Learning Outcomes

Upon successful completion, the apprentice is able to:

3.1 Identify work site considerations.

3.2 Determine the job methods, assignments and process.

3.3 Determine material and equipment.

3.4 Establish lockout, tagging and hold-off procedures as per the Utility Work Protection Code.

Learning content

3.1 Identify work-site considerations.

- Assess job site requirements.
- Interpret maps and feeder prints to determine action or process required.
- Notify required authorities having jurisdiction.
- Assess the time of interruption for customer to determine most practical and economic solution.
- Assess resources available to determine action or process required.

3.2 Determine the job methods, assignments and process.

- Complete a detailed written document on the job process.
- Hold a thorough tailboard conference with fellow workers.
- Identify hazards associated with the job.
- Determine work method required to complete the job.
- Assign job tasks

3.3 Determine material and equipment.

- Select the material required for the job.
- Select the equipment necessary to complete the job.
- Interpret the work orders for installation purposes.

3.4 Establish lockout, tagging and hold-off procedures as per the Utility Work Protection Code.

- Describe how to lock out mechanical and electrical equipment according to all applicable codes and company policies and procedures.
- Describe the tagging procedures of mechanical and electrical equipment according to applicable codes and company policies and procedures.
- Demonstrate knowledge of applicable codes and company policies and procedures.
- Determine which conditions cause mechanical and electrical equipment to be tagged and locked out.
- Interpret maps and feeder prints to determine what action or process is required.
- Identify the need for and demonstrate the ability to obtain a hold off and tag accordingly.
- Record or document the necessary action prior to de-energizing and establishing the applicable procedures as per code.

Number:	S0124
Title:	**Select, operate and maintain tools and equipment.**
Duration:	19 Total Hours
	Theory: 9 hours Practical: 10 hours
Prerequisites:	Unit 3
Co-requisites:	
Reference to training standard:	5423.01, 5423.02, 5423.03

General Learning Outcome

Select, operate and maintain tools and equipment by inspecting, maintaining and using hand, power tools and explosive actuated tools; inspecting, operating and maintaining vehicles and auxiliary equipment and ensuring setup of mobile equipment..

LearningOutcomes

On completion of this unit of learning the apprentice will be able to:

4.1 Inspect, maintain and use hand, small power tools and explosive actuated tools.

4.2 Inspect, operate and maintain vehicles and auxiliary equipment.

4.3 Ensure setup of mobile equipment.

Learning content

4.1 Inspect, maintain and use hand, small power tools and explosive activated tools.

- Identify and describe the correct application of the tools.
- Identify and document defects or deficiencies.
- Perform minor adjustments.
- Select tools and equipment for their tasks according to efficiency and safety.
- Perform tool maintenance.

4.2 Inspect, operate and maintain vehicles and auxiliary equipment.

- Identify the basic components of a hydraulic system and their functions.
- Identify the basic components of an air brake system.
- Perform regular vehicle and equipment inspection.
- Clean, lubricate and perform minor repairs and adjustments.
- Perform pre-operational checks and functional checks of equipment.
- Identify defects or deficiencies and report to appropriate party.
- Ensure defective equipment is repaired or taken out of service.
- Ensure the equipment is used properly.

4.3 Ensure stability and setup mobile equipment.

- Ground equipment in accordance with safety rules.
- Determine traffic control requirements as per MTO guidelines and demonstrate their correct application.
- Describe and demonstrate the setup of mobile equipment.
- Describe and demonstrate stability checks and tests.
- Interpret load capacity charts and ensure vehicles are within load limitations.
- Ensure vehicle and equipment is used properly.

Number:	S0125
Title:	**Install, maintain and remove power pole systems**
Duration:	21 Total Hours
	Theory: 5 hours Practical: 16 hours
Prerequisites:	Unit 1-3
Co-requisites:	
reference to training standard:	5424.01, 5424.02, 5424.03, 5424.04, 5424.05

General Learning Outcome

Install, maintain and remove power pole systems by identifying type, size and location of pole; framing and erecting pole; straightening pole; removing pole and testing pole for integrity.

Learning Outcomes

On completion of this unit of learning the apprentice will be able to:

5.1 Identify and determine the type, size and location of pole.

5.2 Frame and erect poles.

5.3 Straighten poles.

5.4 Remove poles.

5.5 Test poles for integrity.

Learning content

5.1 Identify and determine the type, size and location of pole.

- Select the correct pole sizing, classification and type.
- Select the location for pole installation.
- Interpret the job staking data documents.
- Interpret verbal instructions specific to job requirements.

5.2 Frame and erect poles.

- Interpret the framing standards and install hardware as per documentation.
- Identify methods of excavating pole holes and anchors.
- Dig hole to prescribed depth.
- Install pole in a safe and efficient manner.
- Use approved work methods to install pole in an electrical environment.
- Backfill the hole and clean up work site to customer satisfaction.
- Complete required documentation.
- Install protective barriers and devices.

5.3 Straighten poles.

- Visually inspect the condition of the pole.
- Identify and demonstrate the method of straightening a pole.
- Identify and demonstrate the correct use of equipment to straighten a pole.
- Demonstrate that the pole will remain in a true vertical position.
- Demonstrate the correct application of temporary or permanent guying systems to ensure true vertical position.
- Install adequate protective barriers and devices.

5.4 Remove poles.

- Identify and demonstrate the method of removing the pole.
- Identify and demonstrate the correct use of equipment to remove the pole.
- Backfill the hole and clean up work site to customer satisfaction.
- Install protective barriers and devices.

5.5 Test poles for integrity.

- Visually inspect condition of pole.
- Perform conditional test of the pole's integrity.
- Identify and describe the various stress points that the pole is subjected to
- Perform temporary guying or supporting techniques when altering strain.

Number: S0126

Title: **Maintain transmission towers and structures**

Duration: 12 Total Hours

Theory: 4 hours Practical: 8 hours

Prerequisites: S0121-S0123

Co-requisites:

Reference to training standard: 5424.01, 5424.02, 5424.03, 5424.04, 5424.05

General Learning Outcome

Maintain transmission towers and structures by conducting visual inspections of transmission towers and structures and maintaining transmission towers and structures.

Learning Outcomes

On completion of this unit of learning the apprentice will be able to:

6.1 Conduct visual inspection of transmission towers and structures.

6.2 Maintain transmission towers and structures.

Learning content

6.1 Conduct visual inspections on transmission towers and structures.

- Visually inspect transmission structure components.
- Complete visual inspection documentation.

6.2 Maintain transmission towers and structures.

- Ascend, descend and work at an elevated height while using fall protection devices.
- Select the appropriate tools and material required to make repairs.
- Select and apply the correct barriers.
- Perform a visual inspection.
- Demonstrate concepts of equipotential grounding and bonding and applying the principles.
- Perform equipment loading calculations.
- Apply rigging principles with moving loads.
- Explain fundamentals of AC power and the hazards of induction.
- Raise and lower equipment, tools and hardware to varying height.

Number:	S0127
Title:	**Install and maintain overhead power systems**
Duration:	66 Total Hours
	Theory: 21 hours Practical: 45 hours
Prerequisites:	S0121-0126
Co-requisites:	
Reference to training standard:	5426.01, 5426.02, 5426.03, 5426.04, 5426.05, 5426.06, 5426.07, 5426.08, 5426.09

General learning outcomes

Install and maintain overhead power systems by installing and removing conductors; splicing or repairing conductors; installing spacers, conductor measurement equipment and markers; installing or removing switches; installing or removing service/secondary conductors; inspecting overhead power systems; upgrading overhead structures; installing anchoring and guying systems and installing, maintaining and troubleshooting street light systems.

Learning Outcomes

On completion of this unit of learning the apprentice will be able to:

7.1 Install and remove conductors.

7.2 Splice or repair conductors.

7.3 Install spacers, conductor measurement equipment and markers.

7.4 Install or remove switching devices.

7.5 Install or remove service/secondary conductors.

7.6 Inspect overhead power systems.

7.7 Upgrade overhead structures.

7.8 Install anchoring and guying systems.

7.9 Install, maintain and troubleshoot street light systems.

Learning content

7.1 Install and remove conductors.

- Identify and describe the differences or similarities in conventional and tension stringing methods.
- Calculate conductor weights and tensions.
- Identify and describe the equipment required for stringing conductors.
- Untie, tie in, clamp, unclamp and sleeve conductors.
- Relocate conductors into an alternate position for stringing purposes.
- Ensure adequate grounding of personnel and equipment.
- Perform equipment loading calculations.
- Ensure proper use of tools and equipment.
- Install protective barriers and devices.
- Work directly from the pole.

7.2 Splice or repair conductors.

- Relocate conductors into an alternate position for repair purposes.
- Ensure adequate grounding of personnel and equipment.
- Perform equipment loading calculations.
- Ensure the proper use of tools and equipment.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work directly from the pole.

7.3 Install spacers, conductor measurement equipment and markers.

- Ensure adequate grounding for personnel and equipment.
- Perform equipment loading calculations.
- Ensure proper use of tools and equipment.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work from an insulated aerial device, insulated pole platform or directly from the pole.

7.4 Install or remove switching devices.

- Ensure adequate grounding for personnel and equipment.
- Perform equipment loading calculations.
- Ensure proper use of tools and equipment
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work from an insulated aerial device, insulated pole platform or directly from the pole.
- Install, maintain and remove switching devices.

7.5 Install or remove service/secondary conductors.

- Ensure adequate grounding for personnel and equipment.
- Perform equipment loading calculations.
- Ensure the proper use of tools and equipment.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work from an insulated aerial device, or directly from the pole.
- Install or remove secondary service wires and make connections.
- Interpret test meter readings.

7.6 Inspect overhead power systems.

- Demonstrate the knowledge of an inspection program.
- Perform a pole inspection.
- Perform a condition criteria assessment.
- Report and document defective conditions.
- Identify causes of television, radio interference.

7.7 Upgrade overhead structures.

- Ensure adequate grounding for personnel and equipment.
- Perform equipment loading calculations.
- Ensure the proper use of tools and equipment.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work from an insulated aerial device, insulated pole platform or directly from the pole.
- Interpret company design standards and apply information during the upgrade process.

7.8 Install anchoring and guying systems.

- Perform equipment loading calculations.
- Ensure proper use of tools and equipment.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Install guying and anchoring systems either manually or with a radial boom derrick.
- Select the most suitable anchoring system as determined by soil conditions.
- Interpret company design standards and apply information for the installation process.
- Work directly from the pole.

7.9 Install, maintain and troubleshoot street light systems.

- Ensure adequate grounding for personnel and equipment.
- Perform equipment loading calculations.
- Ensure the proper use of tools and equipment.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work from an insulated aerial device, or directly from the pole.
- Identify and describe the components of a street light system.
- Test and troubleshoot components of a street light system.

Number:	S0128
Title:	**Troubleshoot Overhead and Underground Power System**
Duration:	15 Total Hours
	Theory: 15 hours Practical: 0 hours
Prerequisites:	S0121, S0122, S0123, S0127, S0128, S0129
Co-requisites:	S0130, S0131
Reference to training standard:	5427.01, 5427.02, 5427.03, 5427.04

General learning outcomes

Assessing and determining power system problems by diagnosing and repairing single and three phase transformers and isolating, making repairs and/or restoring problem areas

Learning Outcomes

On completion of this unit of learning the apprentice will be able to:

8.1 Assess and determine power system problems.

8.2 Diagnose single and three phase transformer problems.

8.3 Isolate, make repairs and/or restore problem area.

Learning Content

8.1 Assess and determine power system problems.

- Understand theory associated with the fundamentals of AC generation.
- Communicate with customers and staff.
- Assess system problems by interpreting available information.
- Select the appropriate tools, equipment and hardware.
- Work from an insulated aerial device, or directly from the pole.

8.2 Diagnose single and three phase transformer problems.

- Understand theory associated with the fundamentals of AC generation.
- Understand theory associated with single phase transformers at an intermediate level.
- Perform voltage and current checks.
- Determine causes of transformer failure at an intermediate level.
- Diagnose and verify defective power system equipment at an intermediate level.
- Perform soil resistivity tests and ensure soil meets design standards.
- Use correct tools and equipment

8.3 Isolate, make repairs and/or restore the problem area.

- Understand theory associated with single phase.
- Sectionalize, parallel feeders, operate switching devices.
- Perform voltage and current checks.
- Determine the causes of equipment failure.
- Use the correct tools and equipment.
- Perform temporary repairs to restore power to the system
- Work from an insulated aerial device or directly from the pole.
- Apply approved grounding techniques to ensure a safe working environment.

Number:	S0129
Title:	**Install, maintain underground distribution systems**
Duration:	35 Total Hours
	Theory: 17 hours Practical: 18 hours
Prerequisites:	S0121-S0124
Co-requisites:	S0128, S0130, S0131
Reference to training standard:	5428.01, 5428.02, 5428.03, 5428.04, 5428.05, 5428.06, 5428.07

General learning outcomes

Install and maintain underground distribution systems by inspecting, trenching and installing ducts, cement, and fiberglass foundations; terminating and splicing primary/secondary underground cables.

Learning Outcomes

9.1 Inspect, trench and install ducts, cement, fiberglass foundations.

9.2 Terminate and splice primary/secondary underground cables.

Learning Content

9.1 Inspect, trench and install ducts, cement, fiberglass foundations.

- Knowledge of rigging and equipment loading calculations.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Read maps, work order prints and trenching profile information.
- Communicate with internal and external parties.
- Interpret and apply company standards.

9.2 Terminate and splice primary/secondary underground cables.

- Ensure adequate grounding for equipment and personnel.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Terminate and splice secondary power conductors by interpreting manufacturers or company specifications.

Number:	S0130
Title:	**Install, maintain and remove transformers**
Duration:	32 Total Hours
	Theory: 9 hours Practical: 23 hours
Prerequisites:	S0121, S0125
Co-requisites:	S0128
Reference to training standard:	5429.01, 5429.02, 5429.03, 5429.04, 5429.05

General learning outcomes

Install, maintain and remove transformers by identifying transformer and voltage requirements; installing and energizing transformer; installing on base, connecting and energizing padmount transformer; performing maintenance checks on transformer and removing transformer.

Learning Outcomes

10.1 Identify transformer and voltage requirements.

10.2 Install and energize transformer.

10.3 Install on base, connect and energize padmount transformer.

10.4 Perform maintenance checks on transformer.

10.5 Remove transformer.

Learning Content

10.1 Identify transformer and voltage requirements.

- Understand theory component of the fundamentals of AC generation
- Understand theory component of single phase transformers
- Interpret information from transformer nameplate or nomenclature
- Follow design standards for installation requirements of single phase transformers.
- Read and interpret voltage and system maps and diagrams.

10.2 Install and energize transformer.

- Ensure adequate grounding of personnel and equipment.
- Demonstrate the knowledge of rigging by performing equipment loading calculations.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work from an insulated aerial device, or directly from the pole.
- Install a single phase transformer and relevant hardware to specified standards.
- Ensure no possible secondary backfeed hazard is present while work is in progress.
- Perform soil resistivity test.
- perform a functional in-service test.

10.3 Install on base, connect and energize padmount transformer.

- Demonstrate knowledge of rigging by performing equipment loading calculations.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Install transformer and relevant hardware to specified standards.
- Ensure no possible secondary backfeed hazard is present while work is in progress.
- Perform soil resistivity test.
- Perform primary and secondary terminations on live front and dead front equipment.
- Perform a functional in-service test on a single phase padmount transformer.

10.4 Perform maintenance checks on transformer.

- Understand theory component associated with the fundamentals of AC generation.

- Understand theory component associated with single phase transformers.
- Ensure adequate grounding for personnel and equipment.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work from an insulated aerial device or directly from the pole.
- Identify and control environmental hazards associated with PCB content and oil spills.
- Ensure no possible secondary backfeed hazard is present.

10.5 Remove transformer

- Ensure adequate grounding of personnel and equipment.
- Knowledge of rigging by performing equipment loading calculations.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work from an insulated aerial device or directly from the pole.
- Ensure no possible secondary backfeed hazard is present.
- Secure transformer for transportation.

Number:	S0131
Title:	**Install, operate and maintain system protection, control and instrumentation equipment.**
Duration:	27 Total Hours
	Theory: 16 hours Practical: 11 hours
Prerequisites:	S0121, S0124
Co-requisites:	S0128, S0129, S0130
Reference to training standard:	5430.01, 5430.02, 5430.03, 5430.04

General Learning Outcomes

Install, operate and maintain system protection control and instrumentation equipment by installing, operating and removing power interrupting devices; ensuring system power quality improvement; selecting, installing and removing meters, metering transformers and associated components; conducting current, voltage and phase rotation checks and surveys.

Learning Outcomes

11.1 Install, operate and remove power interrupting devices.

11.2 Ensure system power quality improvement.

11.3 Select, install and remove meters, metering transformers and associated components.

11.4 Conduct current, voltage and phase rotation checks, surveys.

Learning Content

11.1 Install, operate and remove power interrupting devices.

- Ensure adequate grounding of equipment.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work directly from the pole.
- Demonstrate knowledge of power interrupting devices.

11.2 Ensure system power quality improvement.

- Understand theory associated with the generation of three phase AC power.
- Demonstrate knowledge of improving system power quality.
- Perform power factor calculations with the demo training aids.

11.3 Select, install and remove meters, metering transformers and associated components.

- Demonstrate an in-service functional check.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Install and remove single phase self contained meters.
- Demonstrate awareness of hazards associated with metering devices.

11.4 Conduct current, voltage and phase rotation checks, and surveys.

- Understand basic electrical theory.
- Demonstrate the operation of voltmeters, amp meters.
- Interpret and document readings from the metering devices.

Number:	S0132
Title:	**Handle energized lines using rubber protective equipment**
Duration:	33 Total Hours
	Theory: 11hours Practical: 22 hours
Prerequisites:	S0121-S0125
Co-requisites:	S0127, S0134
Reference to training standard:	5431.01, 5431.02, 5431.03, 5431.04, 5431.05

General Learning Outcomes

Handle energized lines using rubber protective equipment by selecting, testing, inspecting and maintaining rubber protective equipment and barriers; installing and removing rubber protective equipment; tying, clamping and relocating energized conductors using the rubber glove method; Installing and removing openers, insulators and switches on energized conductors using rubber gloves.

Learning Outcomes

On completion of this unit of learning the apprentice will be able to:

12.1 Select, test, inspect and maintain rubber protective equipment and barriers.

12.2 Install / remove rubber protective equipment.

12.3 Tie, clamp, and relocate energized conductors using rubber gloves.

12.4 Install and remove openers, insulators or switches on energized conductors using rubber gloves.

Learning Content

12.1 Select, test, inspect and maintain rubber protective equipment and barriers.

- Select, test, inspect and maintain rubber protective equipment.
- Identify the equipment and its application.
- Store equipment in a preferred location.
- Identify defects and ensure that the equipment is removed from service.

12.2 Install / remove rubber protective equipment.

- Ensure adequate grounding of the equipment.
- Install and remove rubber protective equipment.
- Select the appropriate tools and rubber protective equipment.
- Install protective barriers and devices to eliminate second points of contact.
- Work from an insulated aerial device, insulated pole platform or directly from the pole at the appropriate voltage level.

12.3 Tie, untie, clamp and relocate energized conductors using rubber glove method.

- Ensure adequate grounding of the equipment.
- Knowledge of conductor weights and tensions by performing loading calculations.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices up to 15Kv.
- Work from an insulated aerial device, insulated pole platform or directly from the pole at the appropriate voltage level.

12.4 Install and remove openers, insulators or switches on energized conductors using rubber gloves.

- Ensure adequate grounding of personnel and equipment.
- Knowledge of conductor weights and tensions by performing loading calculation.
- Select the appropriate tools, equipment and hardware.
- Install adequate barriers and devices.
- Work from an insulated aerial device, insulated pole platform.
- Demonstrate the correct sequence of the job.

Number:	S0133
Title:	**Handle energized lines using live line tool methods**
Duration:	27 Total Hours
	Theory: 9 hours Practical: 18 hours
Prerequisites:	S0121-S0125
Co-requisites:	S0127, S0134
Reference to training standard:	5432.01, 5432.02, 5432.03, 5432.04

General Learning Outcomes

Handle energized lines using live line tool methods by selecting, testing, inspecting and maintaining live line tools and barriers; installing, and removing protective barriers using live line tools; tying, clamping and relocating energized conductors using live line tool method; installing, removing and operating connectors, jumpers, and equipment on energized apparatus using live line tool methods.

Learning Outcomese

13.1 Select, test, inspect and maintain live line tools and barriers.

13.2 Install, remove protective barriers using live line tools.

13.3 Tie, clamp and relocate energized conductors using live line tool method.

13.4 Install, remove and operate connectors, jumpers, equipment on energized apparatus using live line tools methods.

Learning Content

13.1 Select, test, inspect and maintain live line tools and barriers.

- Select, test, inspect and maintain live line tools.
- Identify equipment and its application.
- Store the equipment in a preferred location.
- Identify defects and ensure the equipment is removed from service.

13.2 Install, remove protective barriers using live line tools.

- Ensure adequate grounding of personnel and equipment.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work from an insulated aerial device, insulated pole platform or directly from the pole.

13.3 Tie, clamp and relocate energized conductors using live line tool method.

- Ensure adequate grounding of equipment.
- Knowledge of rigging by performing equipment loading calculations.
- Knowledge of conductor weights and tensions by performing loading calculations.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work from an insulated aerial device, or directly from the pole.

13.4 Install, remove and operate connectors, jumpers, equipment on energized apparatus using live line tools methods.

- Ensure adequate grounding of equipment.
- Select the appropriate tools, equipment and hardware.
- Install protective barriers and devices.
- Work from an insulated aerial device, insulated pole platform or directly from the pole.

Number:	S0134
Title:	**Select, maintain and operate rigging equipment**
Duration:	20 Total Hours
	Theory: 11 hours Practical: 9hours
Prerequisites:	S0121-S0124
Co-requisites:	S0125-S0134
Reference to training standard:	5433.01, 5433.02, 5433.03

General Learning Outcomes

Select, maintain and operate rigging equipment by selecting rigging and hoisting equipment; inspecting and maintaining hoisting and rigging equipment; using appropriate rigging and hoisting equipment.

Learning Outcomes

14.1 Select rigging and hoisting equipment.

14.2 Inspect and maintain hoisting and rigging equipment.

14.3 Use appropriate rigging and hoisting equipment.